CLAIMS

What is claimed is:

1. A method for fabricating a whispering-gallery-mode optical resonator, comprising the step of generating a spatial differential of a physical property of an optical fiber between a transverse resonator segment of the optical fiber and longitudinally adjacent transverse segments of the optical fiber, thereby enabling substantial confinement by the resonator fiber segment of a substantially resonant whispering-gallery-mode optical wave propagating around the circumference of the fiber at least partially within the resonator fiber segment.

2. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 1, wherein the differential-generating step comprises the step of reducing the diameter of the longitudinally adjacent fiber segments relative to the diameter of the resonator fiber segment.

3. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 2, wherein the differential-generating step comprises the steps of:

   providing the fiber with a mask that substantially covers the resonator fiber segment but does not cover the longitudinally adjacent fiber segments;

   spatially-selectively etching the optical fiber, thereby removing optical fiber material from the longitudinally adjacent fiber segments and reducing the diameter of the adjacent fiber segments relative to the diameter of the resonator fiber segment; and

   removing the mask from the resonator fiber segment.

4. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 3, wherein the mask-providing step comprises spatially-selective removal of an outer fiber coating from the longitudinally adjacent fiber segments and the mask comprises a portion of the outer fiber coating remaining on the resonator fiber segment.

5. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 4, wherein the mask-providing step comprises spatially-selective laser-machining of the outer fiber coating.

6. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 5, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.

7. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 5, wherein the outer fiber coating comprises a polymeric jacket and laser machining is performed with a UV-emitting excimer laser.
8. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 5, wherein the outer fiber coating comprises a carbon coating and laser machining is performed with a pulsed laser.
9. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 5, wherein the outer fiber coating comprises a carbon coating and laser machining is performed with a substantially continuous laser.
10. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 5, wherein the spatially-selective etching step is performed using aqueous hydrofluoric acid.
11. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 10, wherein the aqueous hydrofluoric acid comprises between about 5% HF and about 50% HF buffered with NH_4F.
12. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 11, wherein the aqueous hydrofluoric acid comprises between about 7% HF and about 8% HF buffered with between about 30% NH_4F and about 40% NH_4F.
13. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 2, wherein the differential-generating step comprises the step of removing optical fiber material from the longitudinally adjacent fiber segments by spatially-selective laser machining, thereby reducing the diameter of the adjacent fiber segments relative to the diameter of the resonator fiber segment.
14. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 13, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.
15. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 13, further comprising the step of removing an outer fiber coating from the resonator fiber segment and the longitudinally adjacent fiber segments prior to laser machining.
16. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 13, further comprising the step of removing an outer fiber coating from the resonator fiber

segment after laser-machining, and wherein an outer fiber coating of the optical fiber on the longitudinally adjacent fiber segments is removed by laser machining.

17. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 13, further comprising the step of etching the resonator fiber segment and the longitudinally adjacent fiber segments after laser machining, thereby reducing laser-machining-induced irregularities on the whispering-gallery-mode optical resonator.

18. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 13, wherein laser machining is performed with a fluorine excimer laser emitting at 157 nm.

19. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 2, further comprising the step of removing optical fiber material from the resonator fiber segment, thereby altering resonant frequencies of the whispering-gallery optical mode.

20. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 19, wherein the diameter of the resonator fiber segment is between about 10 μm and about 125 μm, thereby yielding a free spectral range of between about 500 GHz and about 5 THz.

21. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 20, wherein the diameter of the resonator fiber segment is between about 25 μm and about 50 μm, thereby yielding a free spectral range of between about 1 THz and about 2 THz.

22. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 19, wherein the step of removing optical fiber material from the resonator fiber segment is performed by etching.

23. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 22, wherein the etching step is performed using aqueous hydrofluoric acid.

24. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 23, wherein the aqueous hydrofluoric comprises between about 5% HF and about 50% HF buffered with NH_4F.

25. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 23, wherein the aqueous hydrofluoric acid comprises between about 7% HF and about 8% HF buffered with between about 30% NH_4F and about 40% NH_4F.

26. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 19, wherein the step of removing optical fiber material from the resonator fiber segment is performed by laser machining.

27. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 26, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.

28. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 1, wherein the differential-generating step comprises the step of increasing the diameter of the resonator fiber segment relative to the diameter of the longitudinally adjacent fiber segments.

29. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 28, wherein the differential-generating step comprises the steps of:
providing the fiber with a mask that substantially covers the longitudinally adjacent fiber segments but does not cover the resonator fiber segment;
spatially-selectively depositing dielectric material on the resonator fiber segment of the optical fiber, thereby increasing the diameter of the resonator fiber segment relative to the diameter of the adjacent fiber segments; and
removing the mask from the adjacent fiber segments.

30. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 29, wherein the mask-providing step comprises spatially-selective removal of an outer fiber coating from the resonator fiber segment and the mask comprises portions of the outer fiber coating remaining on the adjacent fiber segments.

31. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 30, wherein the mask-providing step comprises spatially-selective laser-machining of the outer fiber coating.

32. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 31, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.

33. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 31, wherein the outer fiber coating comprises a polymeric jacket and laser machining is performed with a UV-emitting excimer laser.

34. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 29, further comprising the step of rotating the optical fiber during the depositing step, wherein

the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during the depositing step.

35. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 29, wherein the material deposited enables modification of optical properties of the whispering-gallery-mode resonator.

36. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 35, wherein the material deposited enables controlled modulation of optical loss of the whispering-gallery-mode resonator.

37. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 35, wherein the material deposited enables controlled modulation of optical coupling to the whispering-gallery-mode resonator.

38. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 35, wherein the material deposited enables controlled modulation of a resonant frequency of the whispering-gallery-mode resonator.

39. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 35, wherein the material deposited is an electro-optic material.

40. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 35, wherein the material deposited is a doped material.

41. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 35, wherein the material deposited is an electro-absorptive material.

42. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 35, wherein the material deposited is a non-linear optical material.

43. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 35, wherein the material deposited is a semiconductor material.

44. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 28, further comprising the step of removing material from the resonator fiber segment, thereby altering resonant frequencies of the whispering-gallery optical mode.

45. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 44, wherein the diameter of the resonator fiber segment is between about 10 μm and about 125 μm, thereby yielding a free spectral range of between about 500 GHz and about 5 THz.

46. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 45, wherein the diameter of the resonator fiber segment is between about 25 μm and about 50 μm, thereby yielding a free spectral range of between about 1 THz and about 2 THz.

47. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 44, wherein the step of removing material from the resonator fiber segment is performed by etching.

48. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 47, wherein the etching step is performed using aqueous hydrofluoric acid.

49. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 48, wherein the aqueous hydrofluoric acid comprises between about 5% HF and about 50% HF buffered with NH_4F.

50. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 48, wherein the aqueous hydrofluoric acid comprises between about 7% HF and about 8% HF buffered with between about 30% NH_4F and about 40% NH_4F.

51. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 44, wherein the step of removing optical fiber material from the resonator fiber segment is performed by laser machining.

52. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 51, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.

53. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 1, wherein the differential-generating step comprises the step of increasing the refractive index of at least a portion of the resonator fiber segment relative to the refractive index of the longitudinally adjacent fiber segments.

54. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 53, wherein the optical fiber is a UV-sensitive optical fiber and the differential-generating step comprises the step of spatially-selectively irradiating the resonator fiber segment with UV radiation, thereby increasing the refractive index of at least a portion of the resonator fiber segment by densification of the resonator fiber segment.

55. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 54, wherein the UV-sensitive optical fiber is a germano-silicate optical fiber.

56. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 54, further comprising the step of rotating the optical fiber during irradiating, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during irradiating.

57. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 54, wherein the optical fiber is irradiated using a UV-emitting excimer laser.

58. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 54, further comprising the step of hydrogen-loading the optical fiber prior to irradiating, thereby enhancing UV-sensitivity of the optical fiber.

59. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 54, further comprising the step of removing, prior to the irradiating step, cladding from a germano-silicate core of a multi-mode optical fiber, thereby providing the germano-silicate optical fiber for the irradiating step.

60. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 59, wherein the cladding is removed by laser machining.

61. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 59, wherein the cladding is removed by etching.

62. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 53, wherein the differential-generating step comprises the steps of:

providing the fiber with a mask that substantially covers the longitudinally adjacent fiber segments but does not cover the resonator fiber segment;

spatially-selectively doping the resonator fiber segment of the optical fiber with a doping material, thereby increasing the refractive index of the resonator fiber segment relative to the diameter of the adjacent fiber segments; and

removing the mask from the adjacent fiber segments.

63. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 62, wherein the mask-providing step comprises spatially-selective removal of an outer fiber coating from the resonator fiber segment and the mask comprises portions of the outer fiber coating remaining on the adjacent fiber segments.

64. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 63, wherein the mask-providing step comprises spatially-selective laser-machining of the outer fiber coating.

65. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 64, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.

66. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 64, wherein the outer fiber coating comprises a polymeric jacket and laser machining is performed with a UV-emitting excimer laser.

67. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 62, wherein the mask-providing step comprises the steps of:
spatially-selectively removing an outer fiber coating from adjacent fiber segments;
spatially-selectively depositing the mask on the adjacent fiber segments; and
removing the outer fiber coating from the resonator fiber segment.

68. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 67, wherein the outer fiber coating is removed from the adjacent fiber segments by laser machining.

69. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 68, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.

70. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 68, wherein the outer fiber coating comprises a polymeric jacket and laser machining is performed with a UV-emitting excimer laser.

71. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 67, wherein the mask is a dielectric material.

72. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 67, wherein the mask is a metal.

73. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 62, further comprising the step of rotating the optical fiber during the doping step, wherein the

optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during the doping step.

74. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 62, wherein the doping material is germanium, titanium, boron, aluminum, phosphorus, erbium, ytterbium, praseodymium, thulium, holmium, neodymium, or other rare earth element.

75. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 62, wherein doping step comprises allowing the doping material to diffuse into the resonator fiber segment.

76. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 62, wherein the doping step comprises inserting the doping material into the resonator fiber segment by ion implantation.

77. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 62, wherein the doping material enables modification of optical properties of the whispering-gallery-mode resonator.

78. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 77, wherein the doping material enables controlled modulation of optical loss of the whispering-gallery-mode resonator.

79. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 77, wherein the doping material enables controlled modulation of optical coupling to the whispering-gallery-mode resonator.

80. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 77, wherein the doping material enables controlled modulation of a resonant frequency of the whispering-gallery-mode resonator.

81. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 77, wherein the doping material is an electro-optic material.

82. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 77, wherein the doping material is an electro-absorptive material.

83. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 77, wherein the doping material is a non-linear optical material.

84. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 77, wherein the doping material is a semiconductor material.

85. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 53, further comprising the step of removing material from the resonator fiber segment, thereby altering resonant frequencies of the whispering-gallery optical mode.

86. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 85, wherein the diameter of the resonator fiber segment is between about 10 μm and about 125 μm, thereby yielding a free spectral range of between about 500 GHz and about 5 THz.

87. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 86, wherein the diameter of the resonator fiber segment is between about 25 μm and about 50 μm, thereby yielding a free spectral range of between about 1 THz and about 2 THz.

88. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 85, wherein the step of removing material from the resonator fiber segment is performed by etching.

89. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 88, wherein the etching step is performed using aqueous hydrofluoric acid.

90. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 89, wherein the aqueous hydrofluoric acid comprises between about 5% HF and about 50% HF buffered with NH_4F.

91. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 89, wherein the aqueous hydrofluoric acid comprises between about 7% HF and about 8% HF buffered with between about 30% NH_4F and about 40% NH_4F.

92. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 85, wherein the step of removing optical fiber material from the resonator fiber segment is performed by laser machining.

93. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 92, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.

94. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 1, further comprising the step of providing, on at least one of the adjacent fiber segments, an alignment structure for enabling reproducible optical coupling of the resonator fiber segment

with respect to a second optical fiber when the whispering-gallery-mode optical resonator and the second optical fiber are positioned on an alignment device.

95. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 94, wherein the alignment structure comprises a substantially circumferential groove.

96. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 94, wherein the alignment structure comprises a substantially annular circumferential flange.

97. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 94, wherein the alignment-structure-providing step comprises the step of spatially-selectively removing optical fiber material from a first portion of the adjacent fiber segment.

98. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 97, wherein the material-removing step comprises the steps of:
providing a remaining portion of the adjacent fiber segment with a mask;
spatially-selectively etching the first portion of the adjacent fiber segment; and
removing the mask.

99. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 98, wherein the mask-providing step comprises spatially-selective removal of an outer fiber coating from the first portion of the adjacent fiber segment and the mask comprises a remaining portion of the outer fiber coating on the remaining portion of the adjacent fiber segment.

100. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 99, wherein the mask-providing step comprises spatially-selective laser-machining of the outer fiber coating.

101. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 100, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.

102. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 100, wherein the outer fiber coating comprises a polymeric jacket and laser machining is performed with a UV-emitting excimer laser.

103. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 100, wherein the outer fiber coating comprises a carbon coating and laser machining is performed with a pulsed laser.

104. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 100, wherein the outer fiber coating comprises a carbon coating and laser machining is performed with a substantially continuous laser.

105. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 100, wherein the spatially-selective etching step is performed using aqueous hydrofluoric acid.

106. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 105, wherein the aqueous hydrofluoric acid comprises between about 5% HF and about 50% HF buffered with NH_4F.

107. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 105, wherein the aqueous hydrofluoric acid comprises between about 7% HF and about 8% HF buffered with between about 30% NH_4F and about 40% NH_4F.

108. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 97, wherein the material-removing step is performed by laser machining.

109. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 108, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.

110. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 108, further comprising the step of removing an outer fiber coating from the longitudinally adjacent fiber segment prior to laser machining.

111. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 108, further comprising the step of removing an outer fiber coating from a remaining portion of the adjacent fiber segment after laser-machining, and wherein the outer fiber coating on the first portion of the adjacent fiber segment is removed by laser machining.

112. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 108, wherein laser machining is performed with a fluorine excimer laser emitting at 157 nm.

113. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 94, wherein the alignment-structure-providing step comprises the step of spatially-selectively depositing structural material onto a first portion of the adjacent fiber segment.

114. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 113, wherein the material-depositing step comprises the steps of:
providing a remaining portion of the adjacent fiber segment with a mask prior to depositing the structural material; and
removing the mask after depositing the structural material.

115. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 114, wherein the mask-providing step comprises spatially-selective removal of an outer fiber coating from the first portion of the adjacent fiber segment and the mask comprises a portion of the outer fiber coating remaining on the remaining portion of the adjacent fiber segment.

116. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 115, wherein the mask-providing step comprises spatially-selective laser-machining of the outer fiber coating.

117. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 116, further comprising the step of rotating the optical fiber during laser machining, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during laser machining.

118. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 116, wherein the outer fiber coating comprises a polymeric jacket and laser machining is performed with a UV-emitting excimer laser.

119. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 115, further comprising the step of rotating the optical fiber during the depositing step, wherein the optical fiber rotates within a capillary tube, thereby providing substantially concentric rotation during the depositing step.

120. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 1, further comprising the step of providing a modulator for the optical resonator, the modulator being provided on at least one of the resonator fiber segment and the adjacent fiber segments.

121. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 120, wherein the modulator-providing step comprises the step of depositing a modulator material on at least a portion of the circumference of the resonator fiber segment.

122. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 121, wherein the modulator material enables modification of optical properties of the whispering-gallery-mode resonator.

123. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 121, wherein the modulator material enables controlled modulation of optical loss of the whispering-gallery-mode resonator.

124. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 121, wherein the modulator material enables controlled modulation of optical coupling to the whispering-gallery-mode resonator.

125. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 121, wherein the modulator material enables controlled modulation of a resonant frequency of the whispering-gallery-mode resonator.

126. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 121, wherein the modulator material is an electro-optic material.

127. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 121, wherein the modulator material is an electro-absorptive material.

128. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 121, wherein the modulator material is a non-linear optical material.

129. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 121, wherein the modulator material is a semiconductor material.

130. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 120, wherein the modulator-providing step comprises the steps of:

truncating one of the adjacent fiber segments, thereby creating a fiber end-face sufficiently close to the resonator fiber segment so that at least a portion of the fiber end-face lies within the whispering-gallery-mode optical wave substantially confined by the resonator fiber segment; and

depositing a modulator material on at least a portion of the fiber end-face that lies within the whispering-gallery-mode optical wave.

131. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 130, wherein the modulator material enables modification of optical properties of the whispering-gallery-mode resonator.

132. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 130, wherein the modulator material enables controlled modulation of optical loss of the whispering-gallery-mode resonator.

133. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 130, wherein the modulator material enables controlled modulation of optical coupling to the whispering-gallery-mode resonator.

134. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 130, wherein the modulator material enables controlled modulation of a resonant frequency of the whispering-gallery-mode resonator.

135. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 130, wherein the modulator material is an electro-optic material.

136. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 130, wherein the modulator material is an electro-absorptive material.

137. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 130, wherein the modulator material is a non-linear optical material.

138. A method for fabricating a whispering-gallery-mode optical resonator as recited in Claim 130, wherein the modulator material is a semiconductor material.

139. A whispering-gallery-mode optical resonator fabricated according to the method of any of Claims 1 through 138.

140. A whispering-gallery-mode optical resonator, comprising an optical fiber having a spatial differential of a physical property of the optical fiber between a transverse resonator segment of the optical fiber and longitudinally adjacent transverse segments of the optical fiber, thereby enabling substantial confinement by the resonator fiber segment of a substantially resonant whispering-gallery-mode optical wave propagating around the circumference of the fiber at least partially within the resonator fiber segment.

141. A whispering-gallery-mode optical resonator as recited in Claim 140, further incorporating the limitations of any of Claims 2 through 138.

142. A method for fabricating a resonant optical power control device, comprising the steps of:

positioning a transmission optical fiber within a fiber-alignment groove of an alignment device;

securing the transmission optical fiber within the fiber-alignment groove of an alignment device;

positioning a whispering-gallery-mode optical resonator within a resonator-alignment groove of the alignment device; and

securing the whispering-gallery-mode optical resonator within the resonator-alignment groove of the alignment device,

wherein:

the whispering-gallery-mode optical resonator comprises an optical fiber having a spatial differential of a physical property of the optical fiber between a transverse resonator segment of the optical fiber and longitudinally adjacent transverse segments of the optical fiber, thereby enabling substantial confinement by the resonator fiber segment of a substantially resonant whispering-gallery-mode optical wave propagating around the circumference of the fiber at least partially within the resonator fiber segment;

the alignment device comprises a first alignment substrate, and the fiber-alignment groove and the resonator-alignment groove are provided on a first surface of the first alignment substrate; and

the fiber-alignment groove and the resonator-alignment groove of the alignment device position the resonator fiber segment in substantial tangential engagement with the transmission optical fiber, thereby optically coupling the resonator fiber segment and the transmission optical fiber.

143. A method for fabricating a resonant optical power control device as recited in Claim 142, wherein the resonator-alignment groove and the fiber-alignment groove are substantially perpendicular, and differ in depth so that the transmission fiber is in contact with the circumference of the resonator fiber segment when the transmission fiber and resonator fiber segment are positioned within the fiber-alignment groove and the resonator-alignment groove, respectively.

144. A method for fabricating a resonant optical power control device as recited in Claim 143, further comprising the step of sealing the alignment device, thereby isolating the transmission fiber and the resonator fiber segment from a use environment.

145. A method for fabricating a resonant optical power control device as recited in Claim 142, wherein at least one of the adjacent fiber segments is provided with an alignment structure and the resonator-alignment groove is provided with a corresponding alignment structure, thereby enabling reproducible optical coupling of the whispering-gallery-mode optical resonator and the transmission fiber when the alignment structure of the adjacent fiber segment and the corresponding alignment structure of the resonator-alignment groove are engaged.

146. A method for fabricating a resonant optical power control device as recited in Claim 145, wherein the alignment structure of the of the adjacent fiber segment comprises a substantially annular circumferential flange, and the corresponding alignment structure of the resonator-alignment groove comprises a transverse groove for receiving the flange.

147. A method for fabricating a resonant optical power control device as recited in Claim 145, wherein the corresponding alignment structure of the resonator-alignment groove comprises an inwardly-protruding transverse flange, and the alignment structure of the adjacent fiber segment comprises a substantially circumferential groove for receiving the flange.

148. A method for fabricating a resonant optical power control device as recited in Claim 142, wherein the transmission optical fiber has a substantially D-shaped cross-section with a core substantially near a flat portion of the D-shaped cross-section, and the flat portion of the D-shaped cross-section is substantially tangentially aligned with and optically coupled to the resonator fiber segment.

149. A method for fabricating a resonant optical power control device as recited in Claim 142, wherein the transmission optical fiber has a tapered fiber segment and the tapered fiber segment is substantially tangentially aligned with and optically coupled to the resonator fiber segment.

150. A method for fabricating a resonant optical power control device as recited in Claim 149, wherein the transmission-fiber-positioning step comprises the steps of:

positioning a non-tapered optical fiber in the fiber-alignment groove;

heating a central portion of the non-tapered fiber that crosses the resonator-alignment groove; and

pulling each end of the non-tapered fiber during the heating step, thereby producing the transmission fiber in the fiber-alignment groove.

151. A method for fabricating a resonant optical power control device as recited in Claim 150, wherein a central portion of the fiber-alignment groove that crosses the resonator-alignment groove is substantially wider and substantially deeper than end portions of the fiber-alignment groove, thereby reducing contact between the alignment substrate and the central portion of the non-tapered optical fiber.

152. A method for fabricating a resonant optical power control device as recited in Claim 142, wherein the whispering-gallery-mode resonator is provided with a modulator for controlling optical properties of the whispering-gallery-mode resonator, and the alignment device is provided with a modulator control element.

153. A method for fabricating a resonant optical power control device as recited in Claim 152, wherein the modulator control element enables application of electronic signals to the modulator for controlled modulation of the optical properties of the whispering-gallery-mode resonator.

154. A method for fabricating a resonant optical power control device as recited in Claim 152, wherein the modulator control element enables application of optical signals to the modulator for controlled modulation of the optical properties of the whispering-gallery-mode resonator.

155. A method for fabricating a resonant optical power control device as recited in Claim 152, further comprising the step of positioning a secondary optical assembly on the alignment device in substantial tangential engagement with the resonator fiber segment, thereby optically coupling the resonator fiber segment and the secondary optical assembly and enabling controlled modulation of optical coupling of the resonator fiber segment and the secondary optical assembly through the controlled modulation of the optical properties of the whispering-gallery-mode resonator.

156. A method for fabricating a resonant optical power control device as recited in Claim 155, wherein the secondary optical assembly comprises a second optical transmission fiber.

157. A method for fabricating a resonant optical power control device as recited in Claim 155, wherein the secondary optical assembly comprises a second whispering-gallery-mode optical resonator.

158. A method for fabricating a resonant optical power control device as recited in Claim 155, further comprising the step of sealing the alignment device, thereby isolating the transmission

fiber, resonator fiber segment, modulator, and secondary optical assembly from a use environment.

159. A method for fabricating a resonant optical power control device as recited in Claim 152, further comprising the step of sealing the alignment device, thereby isolating the transmission fiber, resonator fiber segment, and modulator from a use environment.

160. A method for fabricating a resonant optical power control device as recited in Claim 142, further comprising the steps of:

positioning a modulator optical assembly on the alignment device in substantial tangential engagement with the resonator fiber segment, thereby optically coupling the resonator fiber segment and the modulator optical assembly and enabling controlled modulation of optical coupling of the resonator fiber segment and the modulator optical assembly through the controlled modulation of the optical properties of the modulator optical assembly;

securing the modulator optical assembly on the alignment device.

161. A method for fabricating a resonant optical power control device as recited in Claim 160, wherein the alignment device comprises a second alignment substrate having the modulator optical assembly secured thereto and adapted to enable reproducible optical coupling of the resonator fiber segment and the modulator optical assembly.

162. A method for fabricating a resonant optical power control device as recited in Claim 161, further comprising sealing the second alignment substrate onto the first alignment substrate, thereby isolating the transmission fiber, resonator fiber segment, and modulator optical assembly from a use environment.

163. A method for fabricating a resonant optical power control device as recited in Claim 160, wherein the alignment device is provided with a modulator control element for controlled modulation of the optical properties of the modulator optical assembly.

164. A method for fabricating a resonant optical power control device as recited in Claim 163, wherein the modulator control element enables application of electronic signals to the modulator optical assembly for controlled modulation of the optical properties of the modulator optical assembly.

165. A method for fabricating a resonant optical power control device as recited in Claim 163, wherein the modulator control element enables application of optical signals to the modulator

optical assembly for controlled modulation of the optical properties of the modulator optical assembly.

166. A method for fabricating a resonant optical power control device as recited in Claim 160, wherein the modulator optical assembly comprises an optical loss modulator.

167. A method for fabricating a resonant optical power control device as recited in Claim 160, wherein the modulator optical assembly comprises a non-linear optical device.

168. A method for fabricating a resonant optical power control device as recited in Claim 160, wherein the modulator optical assembly comprises an electro-optic device.

169. A method for fabricating a resonant optical power control device as recited in Claim 160, wherein the modulator optical assembly comprises an electro-absorptive device.

170. A method for fabricating a resonant optical power control device as recited in Claim 160, wherein the modulator optical assembly comprises a semiconductor device.

171. A method for fabricating a resonant optical power control device as recited in Claim 160, wherein the modulator optical assembly comprises a second whispering-gallery-mode optical resonator.

172. A method for fabricating a resonant optical power control device as recited in Claim 160, wherein the modulator optical assembly comprises a second transmission fiber.

173. A resonant optical power control device fabricated according to the method of any of Claims 142 through 172.

174. A resonant optical power control device, comprising:

an alignment device comprising a first alignment substrate having a fiber-alignment groove and a resonator-alignment groove on a first surface thereof;

a transmission fiber secured within the fiber-alignment groove;

a whispering-gallery-mode optical resonator secured within the resonator-alignment groove, the whispering-gallery-mode resonator comprising an optical fiber having a spatial differential of a physical property of the optical fiber between a transverse resonator segment of the optical fiber and longitudinally adjacent transverse segments of the optical fiber, thereby enabling substantial confinement by the resonator fiber segment of a substantially resonant whispering-gallery-mode optical wave propagating around the circumference of the fiber at least partially within the resonator fiber segment,

wherein the fiber-alignment groove and the resonator-alignment groove of the alignment device position the resonator fiber segment in substantial tangential engagement with the transmission fiber, thereby optically coupling the resonator fiber segment and the transmission fiber.

175. A resonant optical power control device as recited in Claim 174, further incorporating the limitations of any of Claims 143 through 172.